REMARKS

In response to the Office Action dated June 24, 2011, Applicant respectfully requests reconsideration. Claims 29-50 were previously pending in this application. Claims 29, 31, 32, 36-39, 41-43, 45-47 and 50 have been amended. Claim 44 has been canceled. New claim 51 is added. As a result, claims 29-43 and 45-51 are pending for examination with claims 29, 39 and 43 being the independent claims. No new matter has been added.

Allowable Subject Matter

Applicant gratefully acknowledges the Examiner's indication of allowable subject matter. In particular, the Office Action states that claims 39-40 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 39 has been amended to include all of the limitations of the base claim and intervening claims. Accordingly, claims 39 and 40 should be in condition for allowance.

Rejections Under 35 U.S.C. §103

Claims 29-38, 41 and 42 stand rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over U.S. Patent No. 6,837,476 (herein referred to as "Cabuz") in view of U.S. Patent Application Publication No. 2003/0116813 (herein referred to as "Benzel"). Claim 43 stands rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over U.S. Patent No. 5,901,037 (herein referred to as "Hamilton") in view of Benzel. Claims 44-50 stand rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over Hamilton in view of Benzel and further in view of Cabuz.

Cabuz is directed to electropneumatic transducers and electrostatically actuated valves. Benzel describes a micromechanical component having a substrate made from a substrate material having a first doping, a micromechanical functional structure provided in the substrate and a cover layer to at least partially cover the micromechanical functional structure.

Independent claim 29 has been amended to recite "a first opening and a second opening, each opening disposed on the same side of the flexible membrane and providing fluid communication to the pumping volume through the conductive layer" and "wherein the flexible

membrane is constructed and arranged to cover at least one of the first opening and the second opening and produce the pressure sufficient to set a fluid in motion through the ventilating duct so as to cool the integrated chip upon application of the voltage." Independent claim 43 has been amended to recite "the pump including a cavity disposed on the semiconductor substrate and a flexible membrane disposed on the cavity, wherein the cavity includes a first opening and a second opening, each opening disposed on the same side of the flexible membrane and providing fluid communication between the cavity and the at least one ventilating duct, wherein the flexible membrane is constructed and arranged to produce the pressure sufficient to cause fluid motion through the at least one ventilating duct so as to cool the integrated circuit chip." Support for these amendments can be found, for example, in Figs. 4 and 5 and paragraphs [0028]-[0031] of the published specification.

Independent Claim 29: The Valve of Cabuz Is Not a Diaphragm Pump

In the Response to Arguments section (page 15 of the Office Action), the Examiner refers to a publication listed in Cabuz, by Cabuz et al., "The Dual Diaphragm Pump," The 14th IEEE International Micro Electro Mechanical Systems conference, MEMS '01, Jan. 21-23, Interlachen, Switzerland (herein referred to as "Cabuz DDP"), and contends that since the device of Cabuz DDP is called a "diaphragm pump," then the device of Cabuz can also be called a "diaphragm pump." In doing so, the Office Action calls out various elements (e.g., substrate, cavity, inlet/outlet ports, insulator, electrodes, diaphragm, etc.) of each of Cabuz and Cabuz DDP and asserts that the "valve" of Cabuz and the "pump" of Cabuz DDP are similar devices, if not the same. Applicant respectfully traverses this contention.

While the valve of Cabuz and the diaphragm pump of Cabuz DDP may share some common features, the valve of Cabuz and diaphragm pump of Cabuz DDP are very different devices. Cabuz DDP describes a dual-diaphragm pump that includes a chamber and two thin diaphragms having several through holes (see page 520 of Cabuz DDP). As illustrated in Fig. 3 of Cabuz DDP, during operation, both diaphragms are clamped together, sealing each other's holes, and move from the lower chamber wall to the upper chamber wall. Once both diaphragms are pushed up against the upper chamber wall, the lower diaphragm is separated from the upper diaphragm and moves toward

the lower chamber wall. Due to the presence of the through-holes, the lower diaphragm moves without pushing air back through the inlet at the lower chamber wall. Once the lower diaphragm fully seals the inlet against the lower chamber wall, the upper diaphragm moves through the chamber, without producing a net air intake at the outlet, and clamps against the lower diaphragm.

In contrast, the valve structure disclosed in Cabuz is substantially different than the diaphragm pump of Cabuz DDP. Rather than including two separate diaphragms, as required for the diaphragm pump of Cabuz DDP, every embodiment of the valve disclosed in Cabuz has only a single diaphragm structure. Accordingly, the above operation described for the diaphragm pump of Cabuz DDP would be impossible for the valve of Cabuz. As such, the valve of Cabuz does not function and is incapable of functioning in the manner described above with respect to the diaphragm pump of Cabuz DDP. Additionally, as discussed further below, no pumping operation whatsoever is employed by the valve of Cabuz. Instead, each of the implementations of the valve described in Cabuz is employed merely as a switch that *allows* for fluid to flow, rather than driving fluid flow.

Thus, to address the Response to Arguments portion of the Office Action, because the valve of Cabuz and the diaphragm pump of Cabuz DDP have fundamental differences that preclude the ability to refer to them interchangeably, as the Office Action suggests, the valve of Cabuz and the diaphragm pump of Cabuz DDP are not the same. As such, the valve of Cabuz will be considered below in accordance with the teaching of Cabuz – which is as a valve.

Independent Claim 29: The Valve of Cabuz Is Incapable of Producing Pressure Sufficient to Cool an Integrated Chip

The Office Action contends that the alleged device of Cabuz in view of Benzel is capable of performing each of the limitations of claim 29, pointing to the outlet ports 44a, 44b and the flexible membrane 20 of Cabuz which moves through application of voltage. Applicant respectfully traverses this rejection.

Cabuz does not disclose, at least, a pump configured to provide pressure sufficient to set a fluid in motion through a ventilating duct so as to cool an integrated circuit chip and a flexible membrane constructed and arranged to produce the pressure sufficient to set a fluid in motion

through the ventilating duct so as to cool the integrated chip upon application of voltage. As discussed in a previous Response, nowhere in the figures nor in the description/claims of Cabuz does Cabuz show or even mention a pump. A pump is a device for moving or compressing a liquid or gas, while the valve described in Cabuz is not a pump, but rather is a device that merely permits flow of a fluid. Further, the valve of Cabuz is incapable of producing pressure sufficient to cause fluid motion through a ventilating duct so as to cool an integrated chip.

With respect to the implementations taught in Figs. 1-6 of Cabuz, the diaphragm 20 includes openings 25a, 25b which allow fluid to flow *through* the diaphragm and to reach outlet ports 44a, 44b. Cabuz provides no such teaching where pressure of any kind is applied by the valve to move the fluid, much less pressure sufficient to cause fluid motion through a ventilating duct so as to cool an integrated chip. Rather, Cabuz teaches that the embodiments of Figs. 1-6 provide no more than a valve between inlet port 42 and outlet ports 44a, 44b where the primary source of fluid motion through the device (e.g., see arrows in Fig. 3) is external to the device itself; that is, the valve of Cabuz acts merely as a switch that allows or disallows fluid flow. Further, there would have been no reasonable expectation of success for one of skill, having considered a valve with a perforated membrane as taught in Cabuz, to use such a valve as a pump. In fact, a pump having a perforated membrane would be considered to be a damaged pump that is incapable of producing pressure sufficient to cause fluid motion through a ventilating duct that is in fluid communication with the main chamber so as to cool an integrated chip.

The implementations illustrated in Figs. 13-15 also teach a perforated membrane which enables three-way valve functionality through ports 160, 162, 164. Similar to that discussed above regarding the examples depicted in Figs. 1-6 of Cabuz, no reasonable expectation of success would have existed for one of skill in the art at the time of the invention, having considered the particular valve implementation of Cabuz, to use such a valve as a pump. Further, such a valve structure would be incapable of producing pressure sufficient to cause fluid motion through a ventilating duct that is in fluid communication with the main chamber so as to cool an integrated chip.

Figs. 7-9 of Cabuz disclose another implementation of a valve that requires a vent opening 94 for back pressure relief so as to prevent compression of fluid on the upper side of the chamber 86 of the cavity (see col. 9, lines 1-21 of Cabuz). As no teaching is provided in Cabuz to plug the

valve at opening 94 (in fact, such an operation would run counter to Cabuz) so as to create any compression or depression effect from displacement of the membrane, no such pumping function is either realized or suggested. Rather, fluid motion in Fig. 9 of Cabuz occurs in the lower cavity between inlet port 80 and outlet ports 82a, 82b, which is regulated by the opening and closing of opening 80 by the membrane 88. Such functionality results only in a valve – not a pump – where the cause of fluid flow is external to the valve device. Additionally, Figs. 10-12 depict a valve where a vent 128 is added to allow the membrane to move freely, without being subject to a negative back pressure. In this implementation, no pumping operation is employed, but only opening and closing of a valve that merely allows – and does not cause – fluid movement from an inlet to an outlet.

In each of the implementations described in Cabuz, the cause of fluid motion through the valve is external to the device, where the device itself merely acts as a switch that permits or prevents fluid flow. Suction or compression of fluid on one side of the cavity to achieve a pumping function is neither taught nor suggested. Even if the valve of Cabuz were actuated in a manner that produces a small amount of pressure that encourages fluid movement within the valve, such a pressure would be insufficient to cause fluid motion in a ventilating duct so as to bring about cooling of an integrated circuit chip. Accordingly, the valve structure presented in Cabuz is also incapable of producing pressure sufficient to set a fluid in motion through a ventilating duct that is in fluid communication with the main chamber so as to cool an integrated circuit chip.

On the other hand, the current claims include a pump that is configured to provide pressure sufficient to set a fluid in motion through the ventilating duct so as to cool the integrated circuit chip and a flexible membrane constructed and arranged to produce the pressure sufficient to set a fluid in motion through the ventilating duct so as to cool the integrated chip upon application of the voltage. Fig. 1 and paragraph [0027] of the published specification provide an example of a how an integrated circuit may be cooled where deformation of a membrane 6 toward conductive layer 3 results in the *chasing of air toward ventilating duct 4*. Further, Figs. 4 and 5 and paragraphs [0028]-[0031] describe an example of directional pumping from an inlet to an outlet achieved through particular embodiments, for example: 1) choosing respective diameters of the inlet and outlet ports so that the fluid will enter the cavity principally from the inlet; and 2) locating the outlet port in the

center of the cup-like cavity and the inlet port at the periphery, so that the membrane will cover the inlet at the beginning of its displacement and chase fluid through the outlet. Thus, Cabuz not only fails to teach a pump, but also does not teach a combination of features that gives rise to cooling of an integrated chip, such as a flexible membrane and a configuration of openings in the cavity that provide the ability to achieve directional pumping that leads to cooling of the integrated circuit chip.

Accordingly, Cabuz does not disclose, at least, a pump configured to provide pressure sufficient to set a fluid in motion through the ventilating duct so as to cool the integrated circuit chip and a flexible membrane of the pump constructed and arranged to produce the pressure sufficient to set a fluid in motion through the ventilating duct so as to cool the integrated chip upon application of the voltage. Thus, the rejection of independent claim 29 should be withdrawn.

Independent Claim 43: Hamilton Does Not Disclose a Flexible Membrane Constructed to Produce Pressure Sufficient to Cause Fluid Motion so as to Cool an Integrated Chip

Hamilton does not disclose a flexible membrane is constructed and arranged to produce the pressure sufficient to cause fluid motion through the at least one ventilating duct so as to cool the integrated circuit chip. Hamilton describes no more than a coolant pump 28' including a self-contained pyramidic input valve 46_i and an output valve 46_o. No flexible membrane of any kind is disclosed in Hamilton.

Accordingly, Hamilton does not disclose a flexible membrane is constructed and arranged to produce the pressure sufficient to cause fluid motion through the at least one ventilating duct so as to cool the integrated circuit chip. Thus, the rejection of independent claim 43 should be withdrawn.

Comments on the Dependent Claims

For at least the same reasons as for independent claims 29 and 43, the rejections of each of claims 30-42 which depend from claim 29; and each of claims 45-50 which depend from claim 43, should also be withdrawn. However, Applicant reserves the right to specifically address the patentability of dependent claims, if deemed necessary.

Cabuz Does Not Disclose First and Second Openings Arranged to Cause Fluid Introduced Through the Second Opening to Move Predominantly From the Second Opening Toward the First Opening

Regarding currently amended dependent claim 36, Cabuz does not disclose a first opening and a second opening constructed and arranged to cause fluid introduced into the pumping volume through the second opening to move predominantly in a direction from the second opening toward the first opening upon application of the voltage to the flexible membrane. Referring to ports 44a, 44b illustrated in Fig. 1 and ports 122, 124 depicted in Fig. 10 of Cabuz, such arrangements do not give rise to fluid introduced into the chamber to move predominantly from one port toward the other port upon application of the voltage. Rather than a directional flow, fluid flows non-discriminately between ports 44a, 44b; and between ports 122, 124 (see col., 7, lines 1-6; and col. 9, lines 56-62 of Cabuz).

In contrast, shown as an example in Figs. 4 and 5 of the current application, a first opening O1 is positioned closer to a center of the cavity 2 than a second opening O2, giving rise to a configuration where air is pumped directionally from opening O2 to opening O1. As described above, by locating the outlet opening O1 close to the center of the cup-like cavity and the inlet opening O2 at the periphery, the flexible membrane will cover the inlet opening O2 at the beginning of its displacement and chase fluid through the outlet opening O1.

Accordingly, Cabuz does not disclose a first opening and a second opening constructed and arranged to cause fluid introduced into the pumping volume through the second opening to move predominantly in a direction from the second opening toward the first opening upon application of the voltage to the flexible membrane. Thus, the rejection of dependent claim 36, on this ground, should be withdrawn.

Cabuz Does Not Disclose or Make Obvious a Second Opening Larger than a First Opening to Promote Introduction of More Air Through the Second Opening Than the First Opening

With respect to dependent claim 42, the Office Action contends that because Cabuz discloses different sizes of ports 42, 44, it would have been obvious to optimize the size of the openings depending on the product specific requirements. Applicant respectfully traverses this rejection.

Given the claim amendments as presented above, Cabuz does not disclose nor would it have been obvious for one of skill to include in the valve of Cabuz a first opening and a second opening, each opening disposed on the same side of the flexible membrane and wherein the second opening is larger than the first opening to promote the introduction of more air through the second opening than the first opening to the pumping volume when voltage is reduced. In Fig. 1 of Cabuz, port 42 having a size larger than ports 44a, 44b is located at an opposite side of the flexible membrane from ports 44a, 44b. Further, ports 44a, 44b are constructed to be of the same size so that air can flow equally between them.

To the contrary, paragraph [0031] of the published specification describes an example where the size of the second opening O2 is purposely larger than the size of the first opening O1 so as to promote the introduction of a much larger volume of fluid through the second opening O2 than the volume of fluid passing through the first opening O1. Thus, as illustrated in Figs. 4 and 5 of the published specification, upon relaxation of the membrane 6, cavity 2 is filled with air principally coming from ventilating duct 10. Accordingly, the introduction of "fresh" air into cavity 2 mainly occurs through ventilating duct 10 and the exit of "hot" air mainly occurs through ventilating duct 4.

Accordingly, Cabuz does not disclose nor would it have been obvious to include in the valve of Cabuz a first opening and a second opening, each opening disposed on the same side of the flexible membrane, wherein the second opening is larger than the first opening to promote the introduction of more air through the second opening than the first opening to the pumping volume when voltage is reduced. Thus, the rejection of dependent claim 42, on this ground, should be withdrawn.

New Claim 51

New claim 51 is directed to the first opening and the second opening are constructed and arranged to cause fluid introduced into the pumping volume through the second opening to move in a direction predominantly from the second opening toward the first opening upon actuation of the flexible membrane. Support for this claim can be found, at least, in paragraphs [0028]-[0031] of the published specification. Because claim 51 depends from independent claim 43, for at least the same reasons, this claim should be in condition for allowance.

CONCLUSION

In view of the foregoing amendments and remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicants' representative at the telephone number indicated below to discuss any outstanding issues relating to the allowability of the application.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825 under Docket No. S1022.81158US00 from which the undersigned is authorized to draw.

Dated: 10/24/11

Respectfully submitted,

By_____

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